HR-344 Potential Scour Assessments and Estimates of Maximum Scour at Selected Bridges in Iowa

Key Words: Pier Scour, Potential-Scour, Bridges, Erosion, Flooding

Abstract

The results of potential scour assessments at 130 bridges and estimates of maximum scour at 10 bridges in Iowa are presented. All of the bridges evaluated in the study are constructed bridges (not culverts) that are sites of active or discontinued streamflow gaging stations and peak stage measurement sites. The period of the study was from October 1991 to September 1994

The potential scour assessments were made using a potential scour index developed by the U.S. Geological Survey for a study in western Tennessee. Higher values of the index suggest a greater likelihood of scour related problems occurring at a bridge. For the Iowa assessments, the maximum value of the index was 24.5, the minimum value was 3, and the median value was 11.5. The two components of the potential scour index that affected the indices the most in this study were the bed material component, which accounted for 27.1 percent of the overall total of the indices, and bank erosion at the bridge, which accounted for 18.3 percent of the overall total. Because the potential-scour index represents conditions at a single moment in time, the usefulness of potential scour assessments is dependent upon regular assessments if the index is used to monitor potential scour conditions; however, few of the components of the index considered in this study are likely to change between assessments.

The estimates of maximum scour were made using scour equations recommended by the Federal Highway Administration. In this study, the long-term aggradation or degradation that occurred during the period of streamflow data collection at each site was evaluated. The stream-bed appeared to be stable at 6 of the 10 sites, was degrading at 3 sites, and was aggrading at 1 site. The estimates of maximum scour were made at most of the bridges using 100-year and 500-year flood discharges. Other discharges also were evaluated at four of the bridges. With respect to contraction scour, channel cross sections measured during floods show parts of the stream-bed to be scoured lower than the computed maxi-mum contraction scour depths at 4 of the 10 sites. The measured discharges at three of the sites were less than the respective 100-year floods used to compute scour.

No pier-scour measurements were obtained in the study except for about 4 feet of local pier scour that was measured at the bridge over the Iowa River at Wapello, Iowa. However, the streambed was below the base of the pier footing, which is supported by piling, at the time the measurement was made.

Discharge measurement cross sections collected at two other bridges, which are not supported by piling, show the streambed between the piers to be lower than the bases of the piers. Additional investigation may be warranted at these sites to determine whether the streambed has been scoured below the bases at the upstream edges of the piers.

Although the abutment scour equation predicted deep scour holes at many of the sites, the only significant abutment scour that was measured was erosion of the embankment at the left abutment at one bridge after a flood.